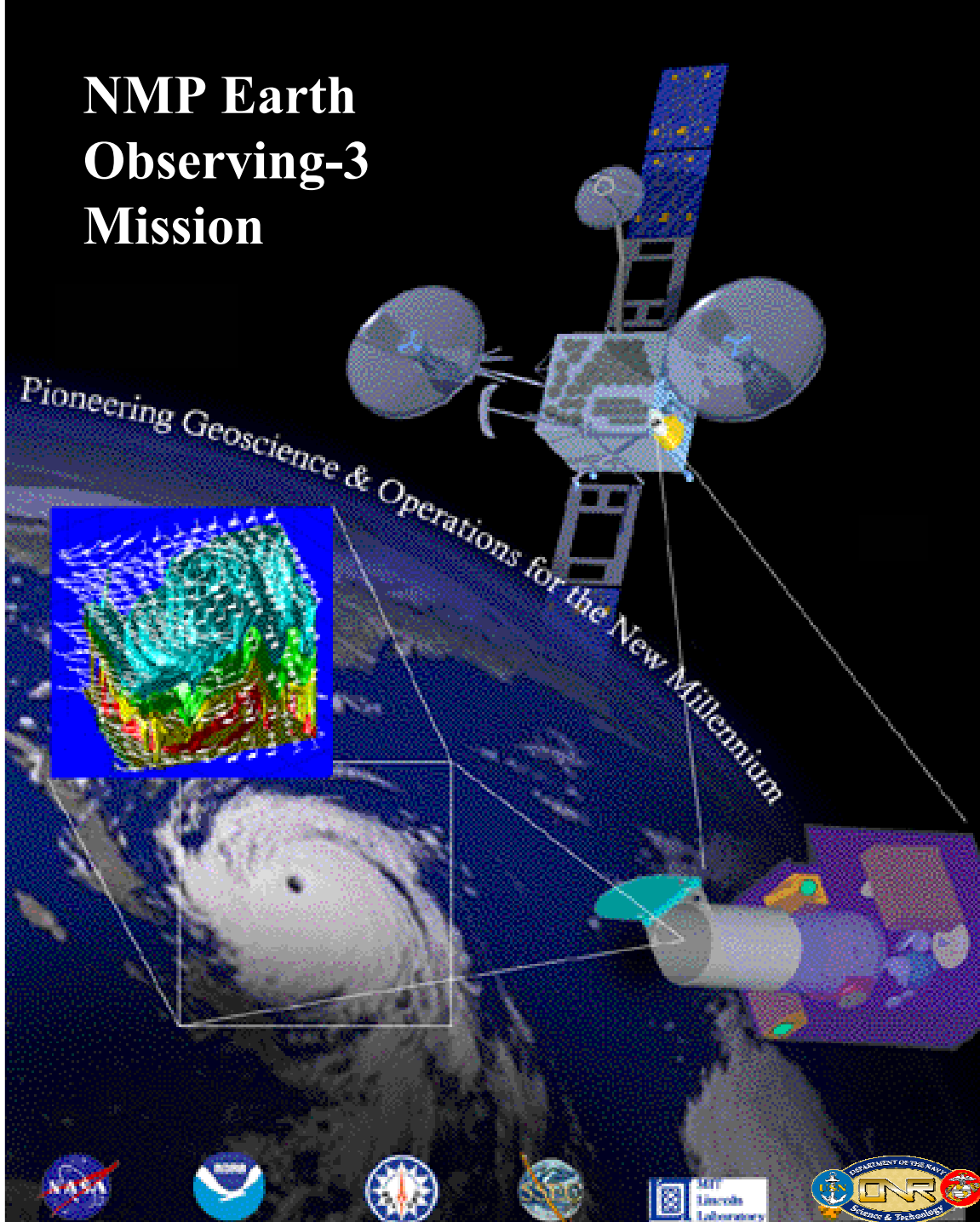
Geostationary Imaging FTS (GIFTS)

Breakthrough Technology To Revolutionize the Weather Analysis/Forecast Operation

W.L. Smith (NASA LaRC)

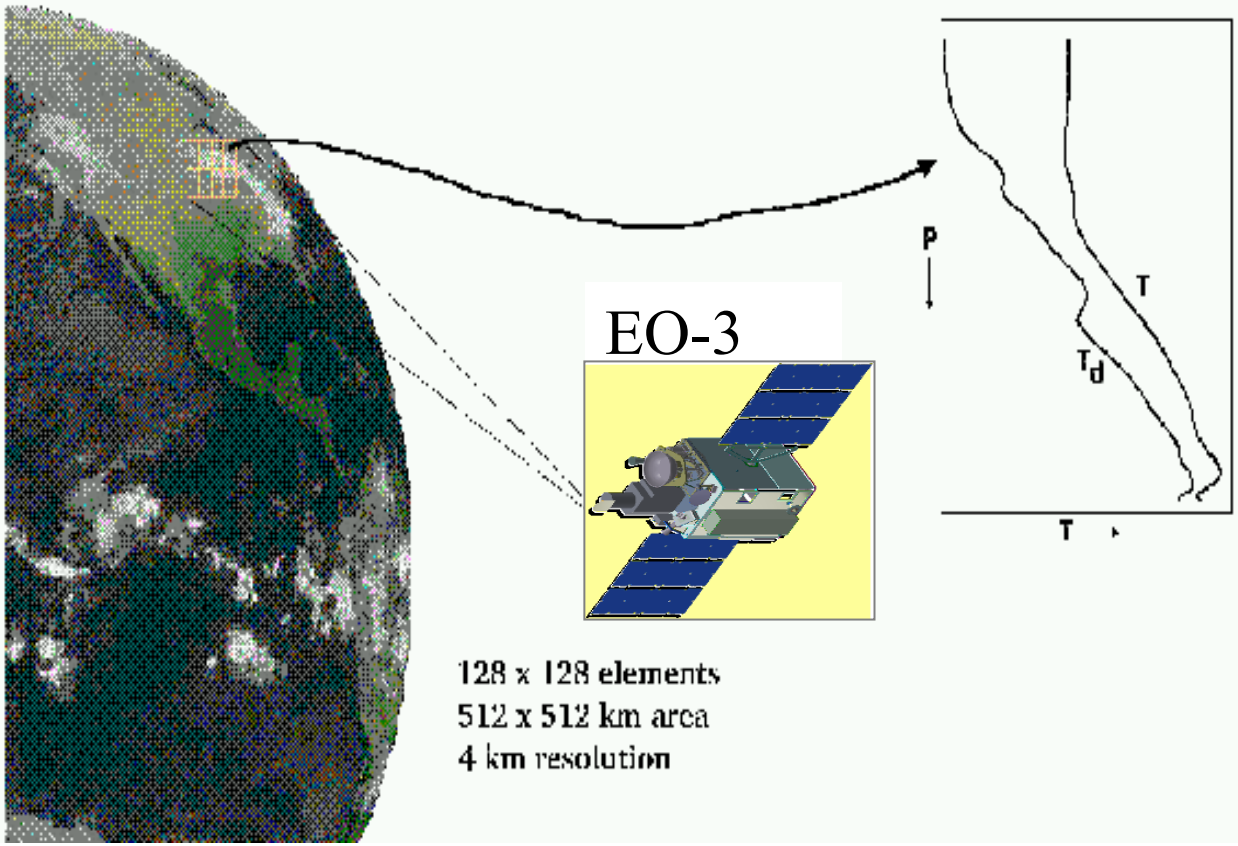
Weather Accident Prevention Annual Project Review

Hampton, Virginia, Radisson Hotel
May 23-25, 2000



Geostationary Imaging FTS (GIFTS)

A Large Focal Plane Array Imaging FTS (Super-Sounder) for Geosynchronous Satellite Application



Geostationary Imaging FTS (GIFTS)

Measurement Objectives:

Primary: **Greatly Improve Weather Forecasts By Measuring the Horizontal and Vertical Flux of Water Vapor**

Observe Temperature, Water Vapor, Clouds, and Tracer Wind* Profiles with HighVertical, Horizontal, and Temporal Resolution

Secondary: **Demonstrate Utility of Geostationary Satellites for Atmospheric Chemistry Studies**

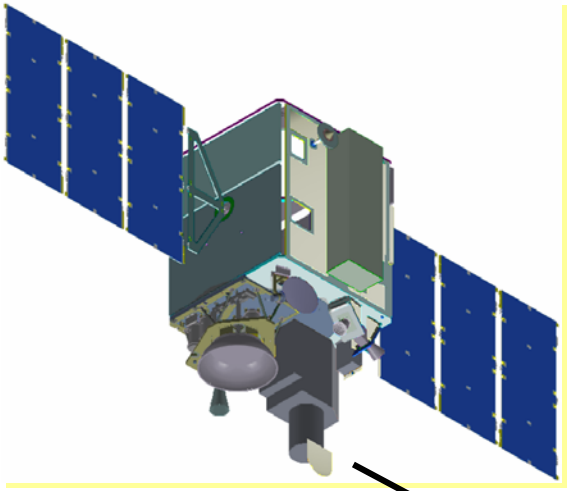
Observe Vertical Profiles and Transport of Radiatively Active Trace Gases including H_2O, CO, O_3, SO_2

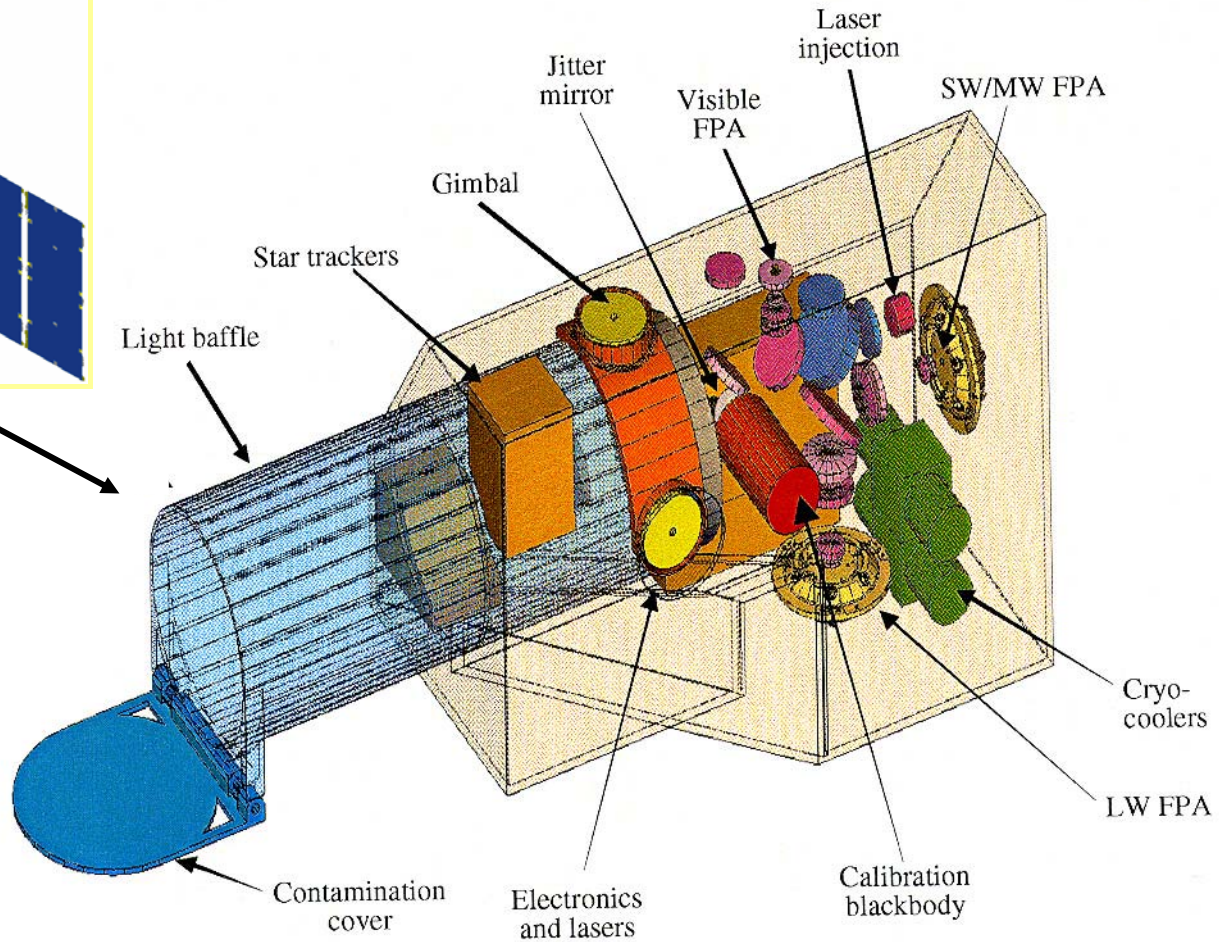
Technology Basis: **Combine Measurement Technologies**

Fourier Transform Spectrometer (FTS) with Large area format Focal Plane Array (LFPA) utilizing Active Cooling and On-board Digital Processing

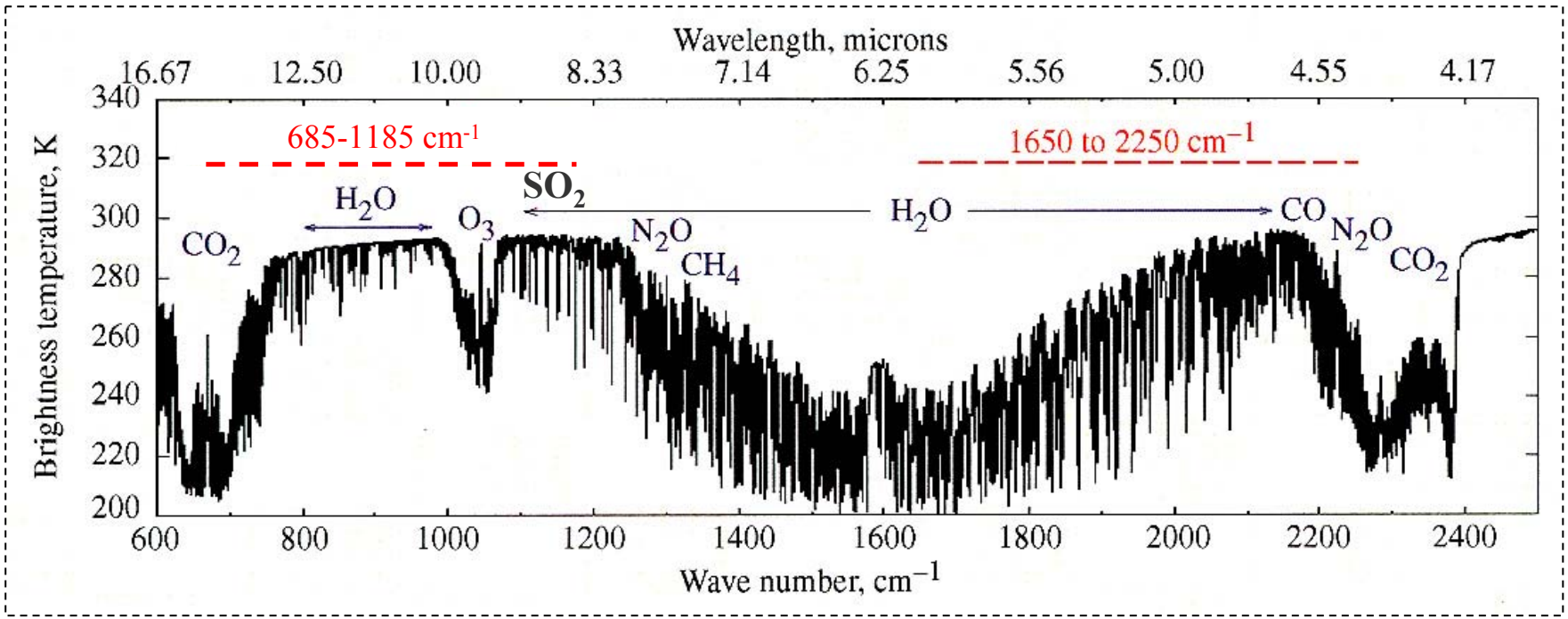
* Uses the Horizontal Displacement of Cloud and Retrieved Water Vapor Features

GIFTS Sensor Module

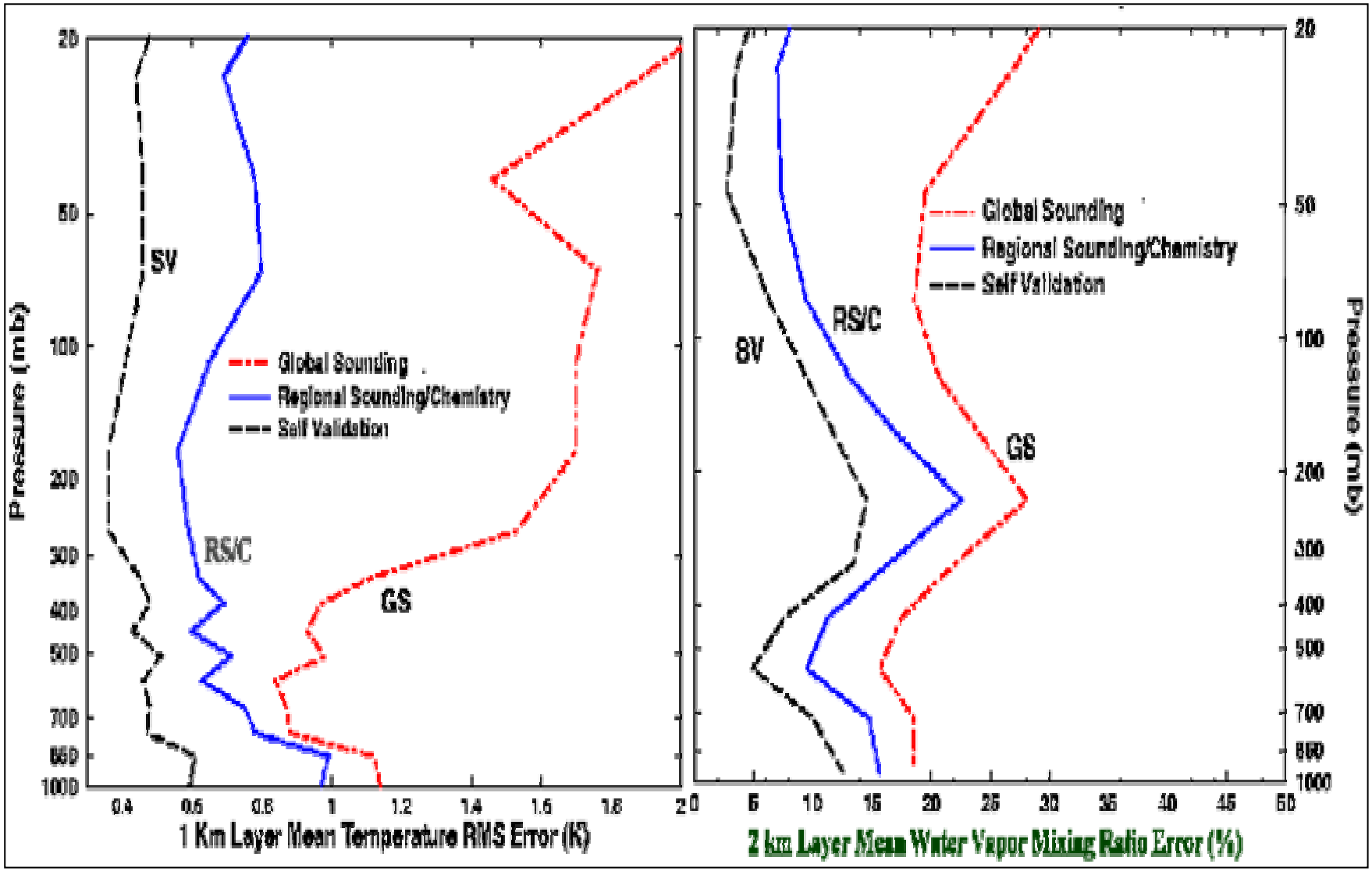




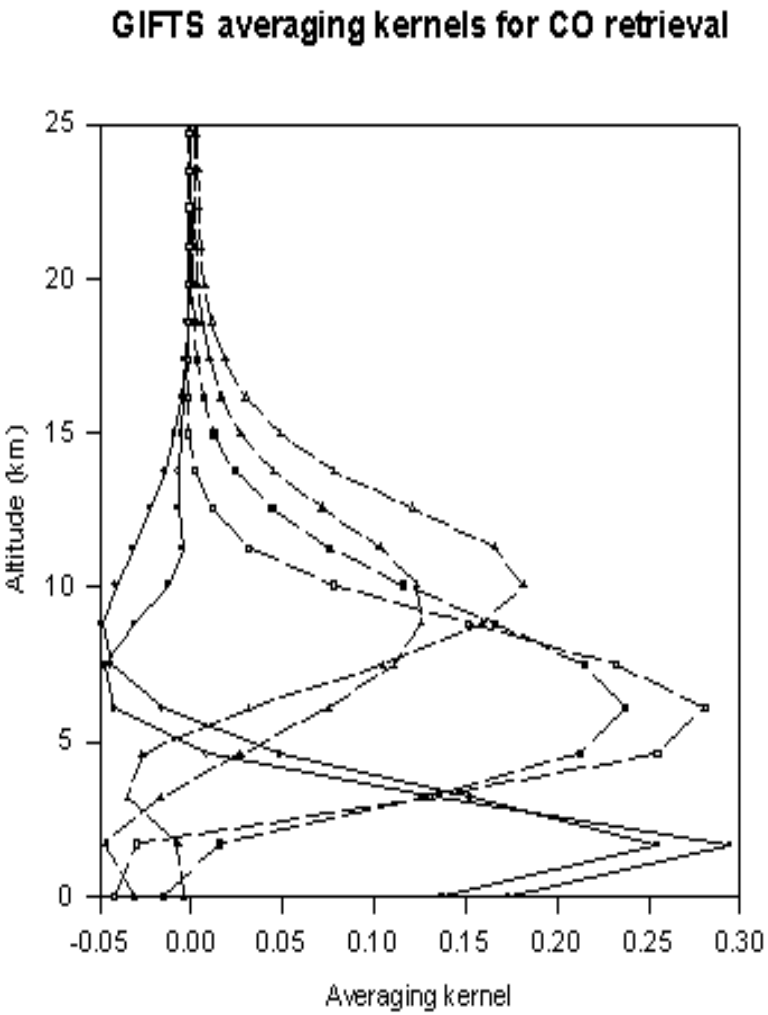
GIFTS Spectral Coverage

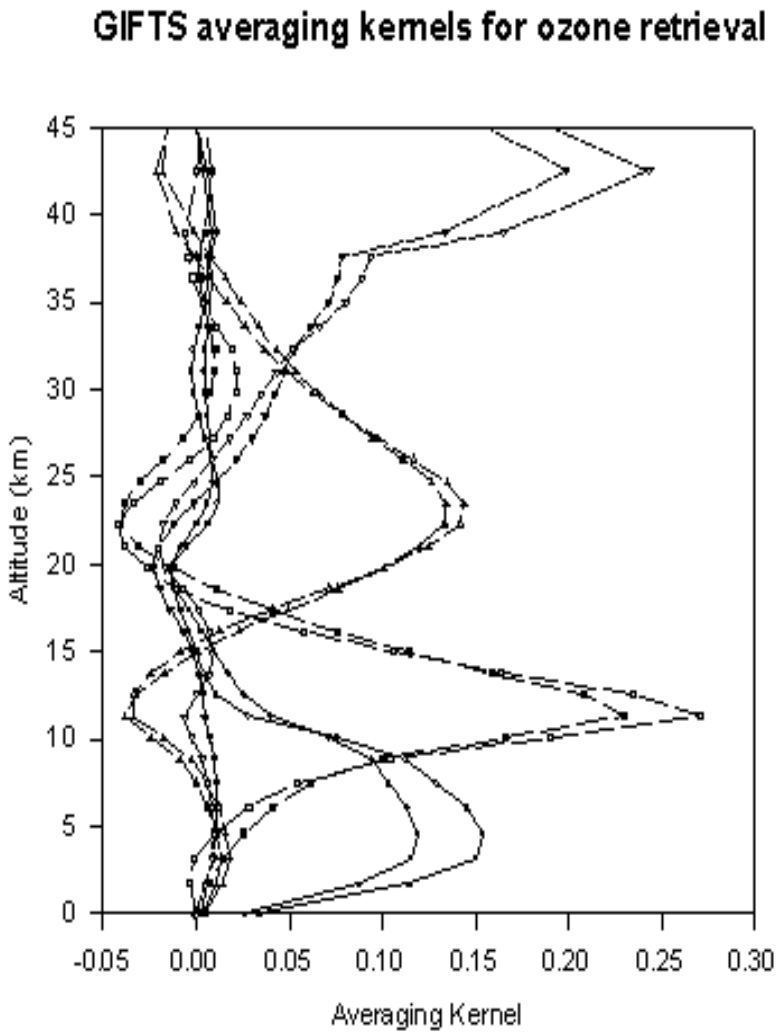


GIFTS Sounding Accuracy

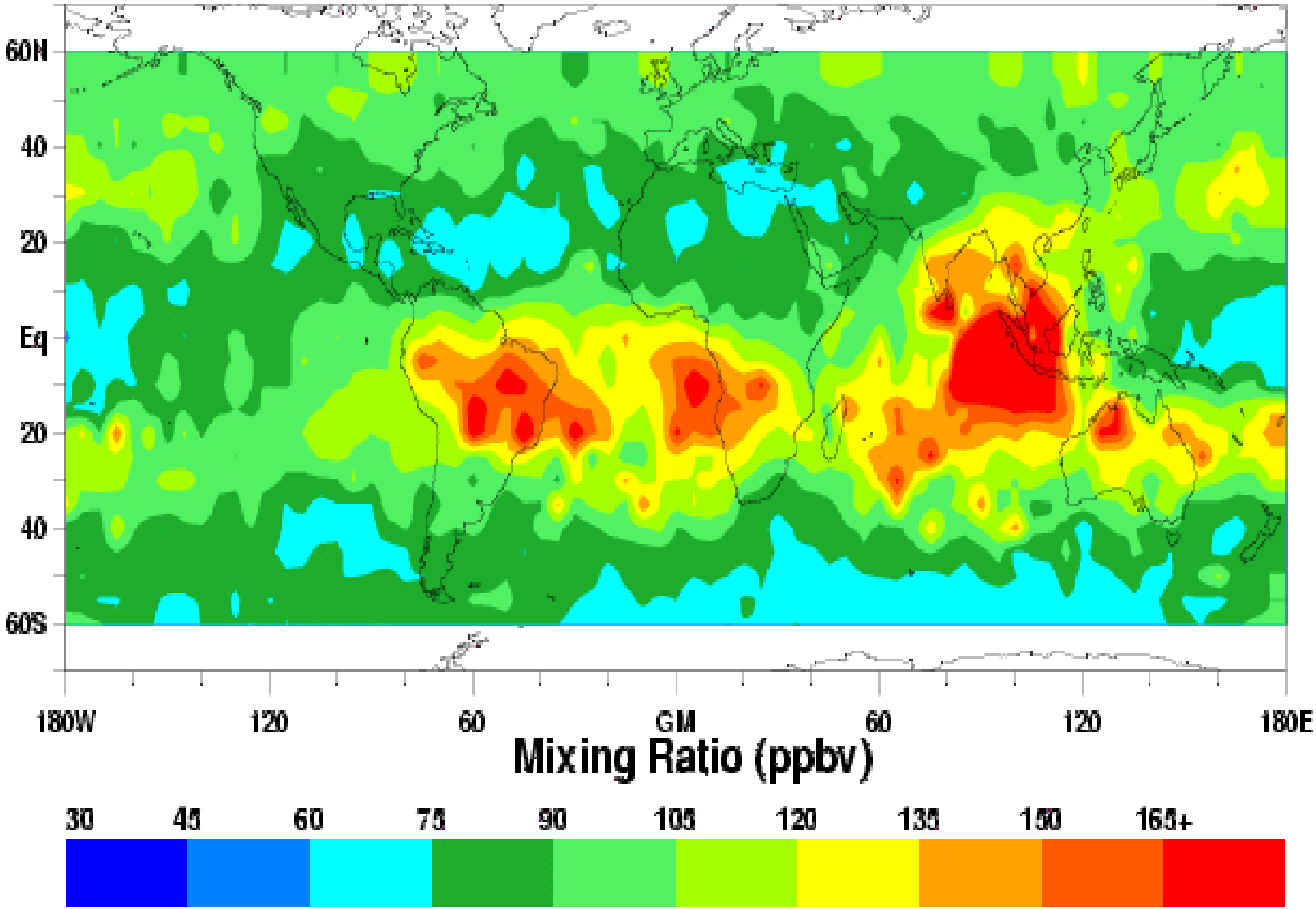


GIFTS Atmospheric Chemistry Measurements





Tropospheric Carbon Monoxide
SRL-2 September 30 - October 11, 1994



Geostationary Imaging FTS (GIFTS)

Measurement Capabilities: **Imaging, Sounding, and Chemistry**

Full Disk Imagery with 5 minute refresh rate, IR (4 Km) /VIS (1 Km)

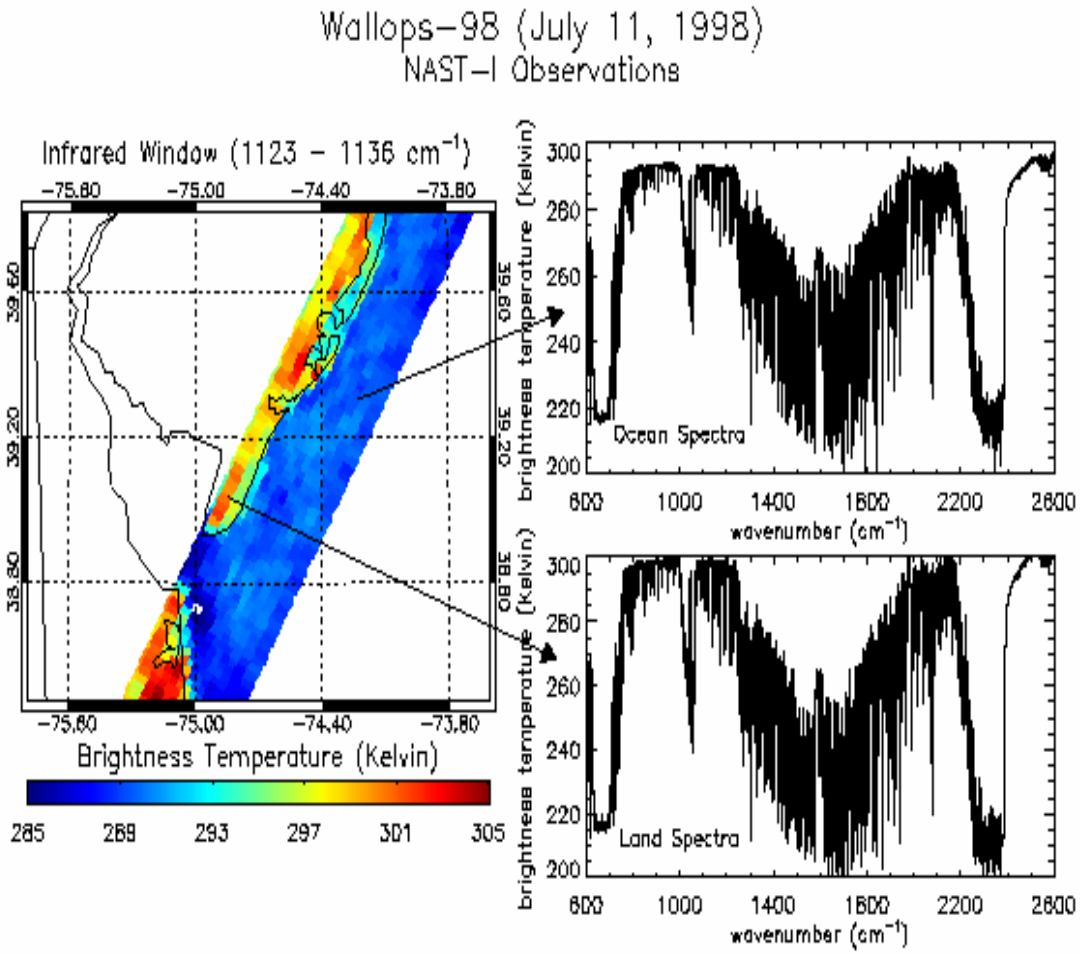
Regional (6000 km x 6000 km) Imagery, Multi-spectral IR and Day/night Visible Imagery, with One (1) minute refresh rate

Full Disk Sounding: Hourly Temperature, Moisture, and Winds for Global Forecasting

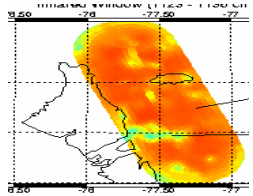
Regional (6000 km x 6000 km) Sounding: Half Hourly, High Spatial Resolution Temperature, Moisture, and Wind Soundings for Regional Weather Forecasting

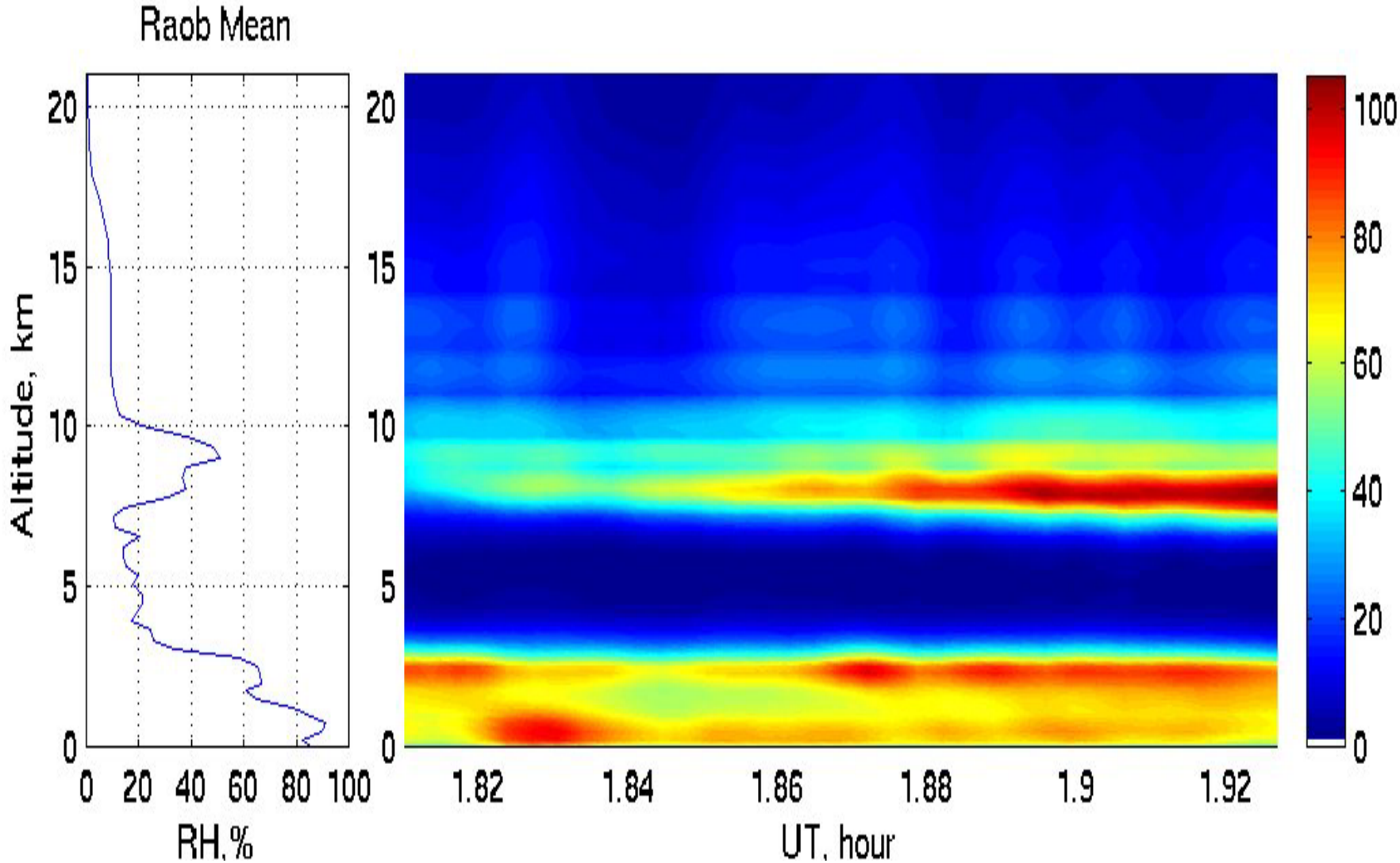
Mesoscale (3000 km x 3000 km) Sounding: Hourly, Ultra-high Vertical Resolution Soundings for Chemistry, Hazardous Weather Prediction Applications, and Self-Validation of Regional and Full Disk Products

Airborne Demonstration GIFTS Measurement Capability

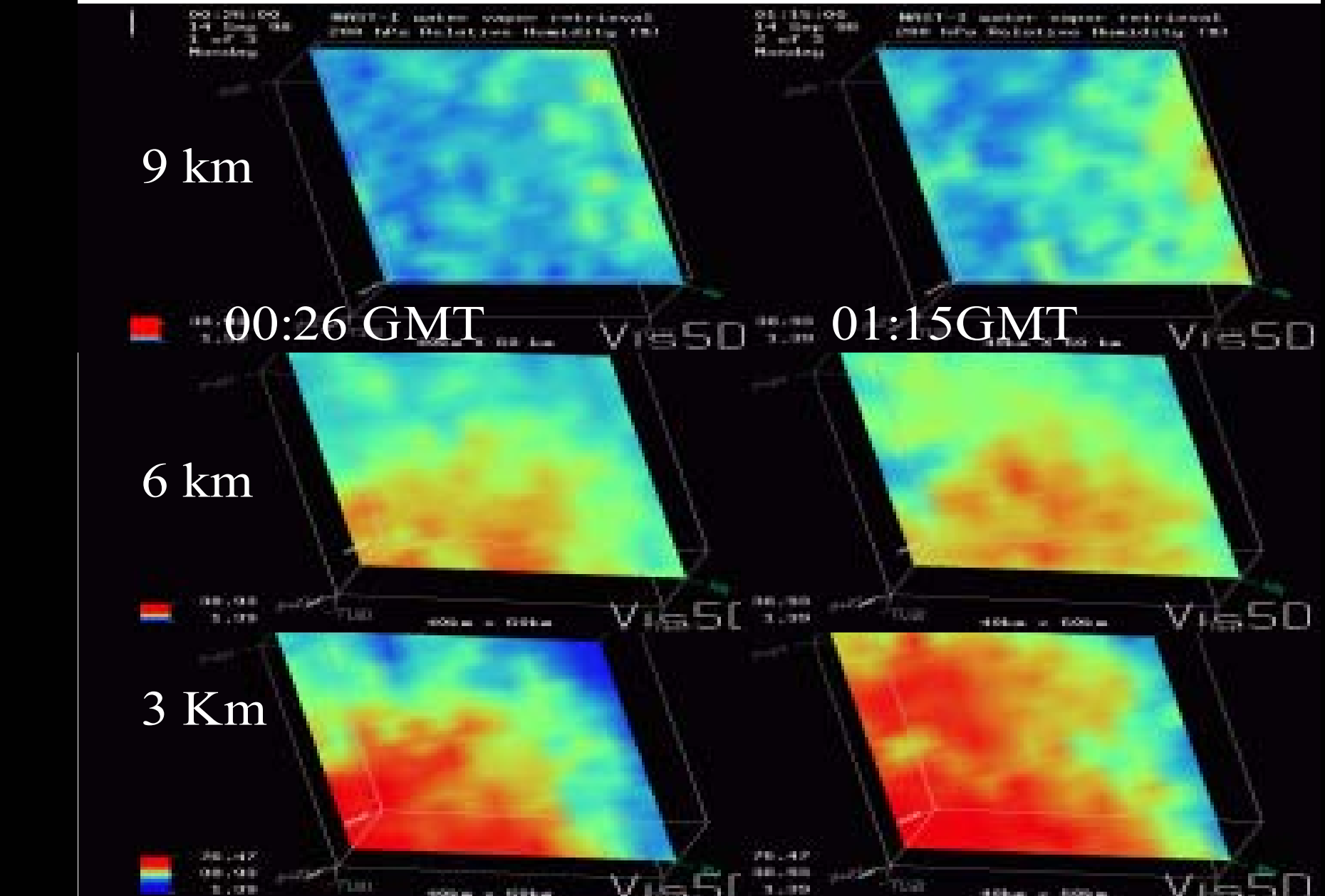


NAST-I Demostrates GIFTS Water Vapor Profiling Capability (Sept. 14, 1998)





NAST-I Demonstration of GIFTS Wind Profiling Capability

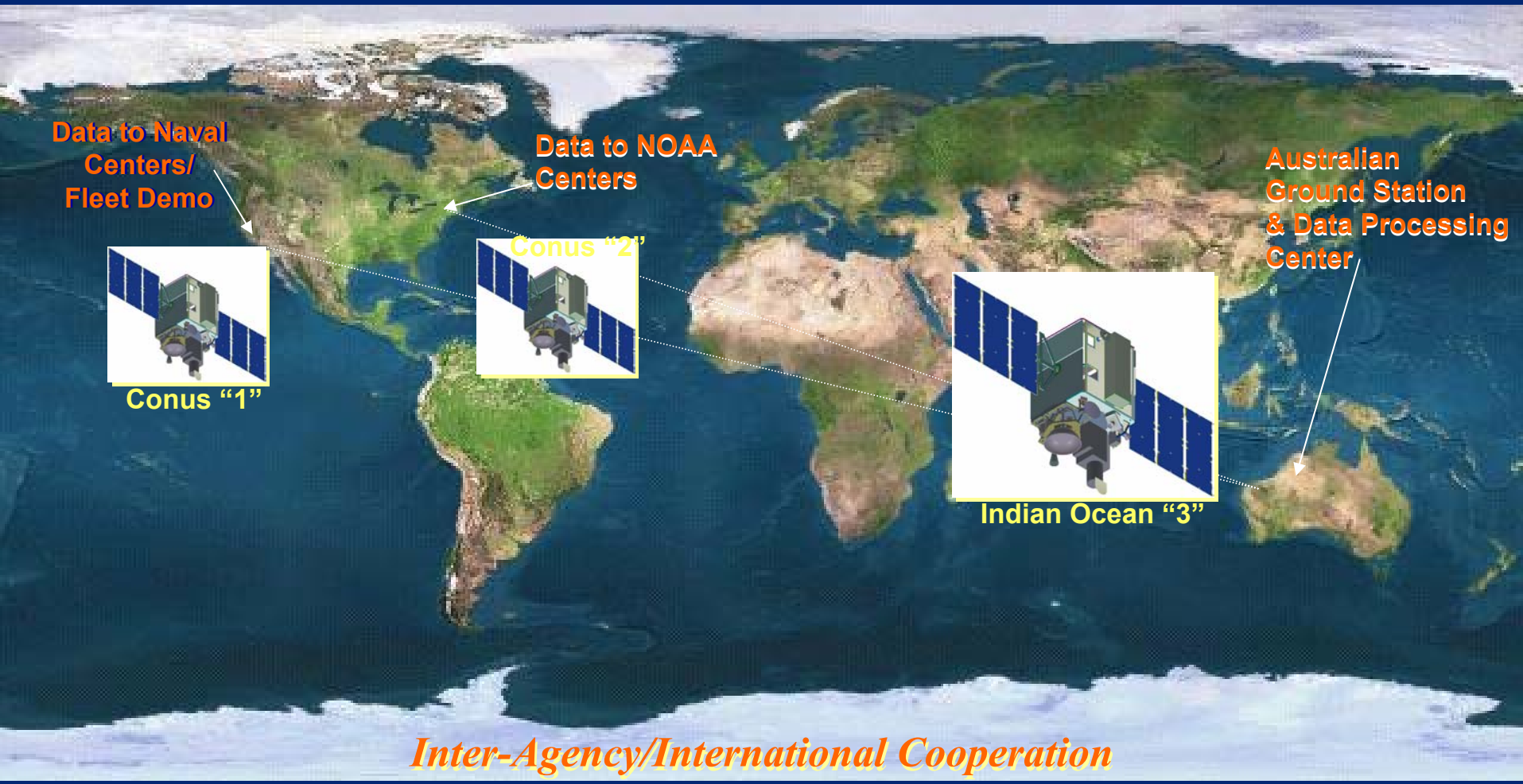


GIFTS Aviation Applications

- ***Radiance Spectra*** can be used to map cloud-top height, temperature, and ice/water phase (i.e., icing conditions), volcanic aerosol, fog, etc.
- ***Soundings (T,q,V)*** provide improved numerical weather forecasts and measure (i.e., nowcast) convective instability, wind shear, flight altitude winds, visibility, PBL height
- ***Images*** of derived products can be provided with a 5 - 30 minute frequency

NASA and NAVY Partnership

GIFTS/IOMI Enables Improved Global Weather Prediction



Inter-Agency/International Cooperation

Department of Commerce/NOAA

DoD/Space Test Program

Bureau of Meteorology Australia